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FOREST RESEARCH NOTES

U.S.DEPARTMENT OF AGRICULTURE
FOREST SERVICE
CALIFORNIA FOREST AND RANGE
EXPERIMENT STATION *

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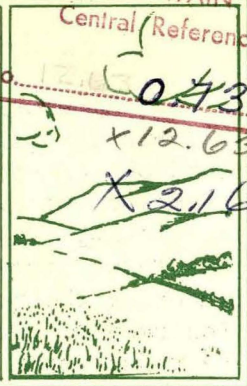

No. 73 August 8, 1950

COSTS OF RODENT CONTROL IN PINE REGENERATION IN CALIFORNIA[1/]

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Introduction

The control of seed-eating rodents, combined with the proper method of cutting and site preparation, appears essential to get the maximum results of natural seeding of pine. One method of control is by treating the area to be regenerated with a lethal bait prior to seedfall. This note describes such a method and costs of treatment for the westside and eastside Sierran pine types in California.[2/]

1/ Grateful acknowledgment is made to Joseph Keyes, Biologist, U. S. Fish and Wildlife Service, for his assistance and guidance of the rodent control project.

2/ The westside Sierran pine type includes that portion of the California pine region on the western slope of the Sierra Nevada — the eastside type (in California), the portion on the eastern slope and including the northeastern lava plateau.

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Foresters have long realized the need to control seed-eating rodents in obtaining pine reproduction when depending on either natural seedfall or some form of artificial seeding.[3/] [4/] [5/] Willis[5/] has advocated the abandonment of these regeneration methods because of the complexity of the rodent problem. However, the high cost of planting has forced investigators to give attention to the control of rodents in using the more economical artificial or natural seeding methods. Schopmeyer[6/] reported on the prepoisoning of fifty acres for white pine reproduction in the northern Rocky Mountains. He used a method similar to the one carried out in this experiment. With costs representative of 1938 for CCC labor he found that sowing seed spots, including treatment of the area with lethal bait was about sixty percent as costly as planting. Many other studies using repellents, protective screens, and lethal baits have been reported, but little information is available on the cost of bait distribution for forested areas.

The Experiment

During 1948 areas in both the westside and eastside type of the California pine region were baited prior to seedfall under the direction of Joseph Keyes, Biologist, U. S. Fish and Wildlife Service.

The westside area treated is in the Stanislaus Experimental Forest. It is typical of the mixed pine-fir forests of the central Sierra Nevada. The area ranges in elevation from 5900 to 6600 feet and is characterized by small streams and flats, ridges and steep rocky slopes. Of the 665 acres treated, approximately 200 acres had been cut-over in 1929. This 200-acre area now supports light forest stands with heavy brush. The remaining 465 acres is in virgin timber, of which 90 acres were cut-over in 1948, after the bait had been distributed.

3/ Smith, Clarence F. and S. E. Aldous. 1948. The influence of mammals and birds in retarding artificial and natural reseeding of coniferous forests in the United States. Jour. Forestry 45: 361-369.

4/ Schopmeyer, C. S. and A. E. Helmers. 1948. Seeding as a means of reforestation in the northern Rocky Mountain region. U. S. Dept. Agr. Cir. 772.

5/ Willis, C. P. 1914. The control of rodents in field seeding. Soc. Amer. Foresters Proc. 9: 365-379.

6/ Schopmeyer, C. S. 1940. Successful forestation by direct seeding using poisons for rodent control. Northern Rocky Mountain Forest and Range Experiment Station. Economic Note No. 1.

Sugar pine (Pinus lambertiana Dougl.), the principal pine, had a good seed crop in 1948. Wherever advance growth was absent or inadequate under over-mature stands, cutting was done by clearing small areas before natural seedfall. Seed trees were left around the border of these areas. After cutting, these clear-cut areas were prepared for regeneration by piling slash with a bulldozer and by exposing the mineral soil as a seedbed. Lethal bait was distributed on the regeneration areas and surrounding buffer strips.

The eastside area is in the Blacks Mountain Experimental Forest, located in northeastern California. The terrain is relatively flat with typical open stands of ponderosa pine (Pinus ponderosa Laws.), and Jeffrey pine (Pinus Jeffreyi Grev. & Balf.). Both pines had good seed crops in 1948, and although no cutting was done that year, small open areas surrounded or bordered by seed trees left in the 1947 cutting were scarified to make good seedbeds. Treatment was carried out on 810 acres to check the rodents.

The rodent control program was designed to check three seed-eating rodents: White-footed mice (Peromyscus spp.), chipmunks (Eutamias spp.), and ground squirrels (Citellus spp.). Cone cutting by the California grey squirrel (Sciurus griseus griseus Ord.) and pine squirrels (Tamiasciurus spp.) was negligible during the period of cone development, and no effort was made to control these animals.

Lethal bait was distributed at different times on the two areas. On the Stanislaus area the bait was distributed three months before seedfall. On the Blacks Mountain area it was distributed one to two weeks before seedfall. Quadrat counts of reproduction were made on both areas in 1949. Establishment of new seedlings was moderately successful on the Stanislaus area (707 sugar pine per acre) and very successful on the Blacks Mountain area (6962 ponderosa and Jeffrey pine per acre). It is possible that the timing of the treatment was an important factor in results.

Bait

Two lethal agents were used in treatment of the areas, "1080" (sodium fluroacetate) and thallium sulfate. Oat groats treated with "1080" at the rate of three ounces per 100 pounds of groats made up the bulk of the bait used. To allow for selective feeding by the rodents, however, some bait made by treating 100 pounds of oat groats with 1 pound of thallium sulfate was also used.

Experiments conducted by the U. S. Fish and Wildlife Service[7/] show that $\frac{1}{2}$ to 3 milligrams of "1080" per kilogram of body weight is a lethal dosage, whereas 15 to 20 milligrams of thallium sulfate are required. Hence the baits used on this project were so toxic that two or three grains of bait would kill a mouse and ten grains would kill a ground squirrel.

7/ Personal communication — Joseph Keyes.

It should be emphasized that California State law[8/] requires that only duly authorized persons may distribute these poisoned baits.

Method of Bait Dispersal

Bait was distributed in pinches of 15 to 30 grains every 15 feet along lines 50 feet to one chain apart. Where possible the bait was placed at burrows, on stumps and logs, or near other places of rodent activity. With this type of coverage ½ to 2/3 pound of treated oat groats is used per acre. Each regeneration area and a surrounding buffer strip approximately 20 chains wide was baited in this manner.

Crews of three to five men treated the areas in a systematic manner. The crew members spaced themselves 50 feet to one chain apart and the crew leader directed the strip by hand compass. The end man marked the strip with paper as the bait dispersal progressed, thus eliminating duplicate or missed areas when the crew returned on the next strip.

Different conditions encountered on the two areas determined the size of crew as well as the acreage covered per man-day. On the Stanislaus area the steeper slopes, denser underbrush, and the presence of more windfalls and other ground obstructions made it difficult for the members of a five-man crew to keep oriented with each other and to maintain the same pace. Consequently a three-man crew was found to be more efficient. In this steep brushy country it was found easier to run strips along rather than across the contour. On the other hand, at Blacks Mountain, the five-man crew appeared very efficient, covering the relatively flat open areas with no lost time.

Time and Costs

Almost twice as many acres were treated per man-day at the Blacks Mountain Experimental Forest as at the Stanislaus Experimental Forest (table 1). Consequently, the cost per acre treated was only about half as much: 26 cents per acre in the eastside type and 46 cents per acre in the westside type. A little more bait per acre was used at the Stanislaus area, but the difference in cost was only 1 or 2 cents per acre. Bait made with "1080" cost 10 cents per pound; that with thallium sulfate, 20 cents per pound. Labor costs were computed at an arbitrary rate of $1.50 per hour.

8/ State of California, Agricultural Code, Division 2, Chapter 1a, Section 160.2.

Table 1.— Production per man-day and cost of treatment, per acre for total area treated

Location	Acreage treated	Man-days	Acres per man-day	Bait	Bait per acre	Total cost per acre 9/
				lbs.	lbs.	
Stanislaus	665	21.25	31.3	435	0.65	$0.458
Blacks Mountain	810	13.25	61.1	450	0.56	0.255

9/ Labor and bait.

The costs are given on the basis of total area treated so that cost data will be useful in planning similar treatments. Cost data per acre of regeneration area protected by the treatment would be misleading. This is true largely because the acreage treated to protect an acre of regeneration area varies with the size of the regeneration area. For example, assume two logging units, one of 40 acres and one of 640 acres, of which 25 percent in each unit is in need of regeneration. Only 10 and 160 acres, respectively, need protection. Treatment, including a 20-chain buffer strip, would be carried out on 360 and 1440 acres. At $0.458 per acre treated, the costs per acre of regneration area protected would be $16.49 for the 40-acre unit and $4.12 for the 640-acre unit. Other situations would result in still other costs. Therefore, the costs reported in table 1 are the best guides now available for planning rodent control by baiting an area prior to seedfall in the California pine region.

Summary

Past experience and research has shown that rodent control is necessary in the establishment of pine reproduction by methods other than planting in California.

Two areas in the California pine region were treated with lethal bait prior to seedfall to control seed-eating rodents and an analysis of costs was made.

Treatment costs were found to be 46 cents per acre treated in the westside type and 26 cents per acre treated in the eastside type of the California pine region.